



Javaid , A. A., Bennett, V. C., Hollen, L. I., & Kemp, A. (2019). Contact Burns: The Influence of Agents and Mechanisms of Injury on Anatomical Burn Locations in Children <5 Years Old and Associations with Child Protection Referrals. *Archives of Disease in Childhood*.  
<https://doi.org/10.1136/archdischild-2019-318140>

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**Title** Contact Burns: The Influence of Agents and Mechanisms of Injury on Anatomical Burn Locations  
in Children <5 Years Old and Associations with Child Protection Referrals

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### **Keywords**

Children, Contact burns, Safeguarding, Burns, Child protection

### **Word Count**

2384

### **Tables**

4

### **Figures**

1

## **Abstract**

**Title** Contact Burns: The Influence of Agents and Mechanisms of Injury on Anatomical Burn Locations in Children <5 Years Old and Associations with Child Protection Referrals

**Objective** To identify how causative agents and mechanisms of injury influence the location of an accidental contact burn in children and whether these factors differ in cases referred for child protection (CP) assessment.

**Design** Prospective multicentre cross-sectional study.

**Setting** 20 hospital sites across England and Wales including; Emergency Departments, Minor Injuries Units, and Regional Burns Units.

**Patients** Children less than 5 years old who attended hospital for a contact burn (August 2015 to September 2018).

**Main outcome measures** Location of burns with respect to agent and mechanism for accidental contact burns. Secondary outcome; mechanism, agent and location of burns referred for CP assessment.

**Results** 816 accidental burns and 92 referrals for CP assessment. For accidental burns the most common: mechanism was *reaching while stationary* (68%, 553/816), agent was *oven* (24.5%, 200/816) and site was the *hand* (69.2%, 565/816). Burns to head and trunk were rare 3.7% (30/816). The data enabled a tabulation of the locations of burns as predicted by agent and mechanism of injury. The location of the burn was most strongly influenced by mechanism.

Burns from *irons* ( $p<0.01$ ), caused by mechanisms *independent of the child* ( $p=0.01$ ), *unwitnessed* burns ( $p<0.001$ ) and burns to the *head and trunk* ( $p<0.001$ ) were significantly more common amongst the children referred for CP assessment.

**Conclusions** By overlaying agent, mechanism and site it was possible to tabulate and quantify simple narratives of accidental contact burns in population of young children. These findings have the potential to aid clinicians in recognising accidental contact burns.

## **Title**

Contact Burns: The Influence of Agents and Mechanisms of Injury on Anatomical Burn Locations in Children <5 Years Old

## **Introduction**

Paediatric burn injuries are a common presentation to Emergency Departments (ED) accounting for an estimated 40 000 presentations in England and Wales every year<sup>1</sup>. Although scalds account for most burns in children, more recent research has found that the proportion of non-scald burns seen in the ED has increased, likely due to changes in the types of domestic appliances used<sup>2</sup>. The most common non-scald burns are contact burns, which account for 20-39% of all burns to children<sup>3-6</sup>.

Children less than 5 years of age are most at risk of burns, particularly during their second year of life<sup>5,7,8</sup>. Their inquisitive nature leads them to explore their environment, but they lack the motor skills or cognitive understanding to avoid danger<sup>9</sup>.

A difficulty in assessing burns in this age group is that their language skills may not have developed sufficiently to give an accurate history of what happened, making the clinician dependent on the caregiver's story. This can be further complicated when the caregiver has not witnessed the event or when the burn has arisen from neglect or physical abuse<sup>10</sup>. Young children presenting with burns from any cause are at higher risk of future abuse or neglect than matched controls<sup>11</sup>. As such, the clinician needs to be vigilant to safeguarding concerns when a young child presents with a burn.

Kemp et al<sup>5</sup> identified four key factors in the presentations of burns; the agent, the mechanism of injury, the child and the environment. This study aimed to identify the influence of the causative agent and the mechanism of injury, on the anatomical location of the burn. These data will then be compared to cases that were referred for child protection (CP) assessment for safeguarding concerns.

## **Method**

A prospective multicentred study was conducted between August 2015 and September 2018. Data were collected from 20 hospital sites across England and Wales (See Appendix 1).

### **Data Collection**

A proforma, the Burns and Scalds Assessment Template (BaSAT) version 7 (See Appendix 2), was used at all sites to collect data on children aged less than 16 years presenting with a burn. Though patient identifiable data were collected in the original proforma, as these were also used as onsite clinical documentation, cases were given unique identifiers and all data were uploaded to a REDCap database<sup>12</sup> without any patient identifiable information. Cases of household fires were excluded; this was due to the complex nature of household fires that could involve multiple burn types (e.g. flame, contact) as well as the confounding nature of presentation to ED more due to inhalation injuries than to any direct burns.

The children who were less than 5 years old and coded as having suffered a contact burn were included in this study. Data for these cases were exported into SPSS version 25 and Microsoft Excel for analysis. Cases where it was unclear whether there was a CP referral, where the explanation of the mechanism of injury was absent or ambiguous or where information on the location of the burn was missing were excluded from analysis (208 cases excluded, see Figure 1). The remaining cases were categorised as accidental injuries and those where a CP referral was made.

The BaSAT proforma was completed depending upon the workload faced by individual centres, with no predetermined sampling process in place. The estimated proportion of total cases of childhood burns from the recruitment centres was 70-80% for each centre involved.

### **Analysis**

A descriptive analysis is provided according to the relationship between three variables, namely the agent, the mechanism of injury and the anatomical location of the burn, categorised as listed in Table

1.





Table 1 – Definitions of variables analysed for this study

Factor	Category	Description
Agent	Ovens	Any part of a domestic cooking oven
	Straighteners	Any heating device used to style hair, which included curling tongs
	Indoor Heating Appliances	Household heating appliances including radiators, heating pipes, fireplaces and gas or electric heaters
	Irons	Household iron
	Kitchen Utensils	Any hot portable item found in the kitchen. Includes cooking-pots, kettles, trays, dishes, cutlery, etc.
	Outdoor Items	Any item found outdoors (e.g. barbeques)
	Miscellaneous Items	All other items not included above
Mechanism	Reaching while Stationary	Incidents where a stationary child reached out and made contact with a hot object, including reaching for hot items, reaching beyond hot items and picking up items that have the potential to burn.
	Child on the Move	Incidents where a mobile child contacted something hot while moving (rolling over, crawling, walking, running, jumping, falling and climbing).
	Pulldown	Incidents where a child pulled a hot item onto themselves.
	Independent of the Child	Incidents where a burn was not due to the child's actions, such as objects falling on to the child or third parties touching the child with a hot object.
	Unwitnessed	Any burn where the carers didn't witness the injury.
Location	Head and trunk	Burn was on the head, face, neck, back, shoulders, chest or abdomen.
	Arms	Burn was anywhere on one arm between the shoulder and wrist.
	Hands	Burn was on either one of the hands.
	Legs	Burn was anywhere on one leg between the hip and the ankle.
	Feet	Burn was on either one of the feet.
	Multiple Sites	Burns to either more than one of the locations listed above or burns that affected the body symmetrically and bilaterally (e.g. burns to both hands).

Index of Multiple Deprivation (IMD) for England<sup>13</sup> and for Wales<sup>14</sup> were applied to code cases according to deprivation quintiles. Of note, IMD groupings are constructed differently in England and Wales, so this value is only reflective of a patient's deprivation relative to their country of residence. IMD groups and other demographic data have been recorded and presented here (Table 2) but not analysed further as part of this study.

The RedCAP database detailed burn locations according to 57 different anatomical sites, these were consolidated into 5 larger areas (Table 1) for the purpose of analysis. All cases where burns were present on more than one of the defined locations were categorised as “multiple sites”.

Comparisons between the proportions of cases affected by different agents, mechanisms and locations of injury were made between accidental cases and those for which a child protection referral was made. Chi-squared testing was used for this comparison and statistical significance was set at  $p < 0.05$ .

## **Results**

A total of 1116 cases of contact burns in children aged less than five years were identified. After exclusion criteria were applied, 908 were suitable for analysis (see Figure 1). Of these, 816 cases were accidental injuries (mean age, 1.70 years; standard deviation (SD), 1.23 years) and 10% (92) were referred for CP assessment (mean age, 1.59 years; SD, 1.24 years) (Table 2). Overall 57.5% were male, burns were most commonly seen between 1 and 2 years of age (32.1%, 292/908) and, 30.9% (281/908) lived in the most deprived IMD quintile. The odds ratio for being from the most deprived IMD quintile for CP referral cases compared to accidental cases was 1.71 (95% confidence intervals; 1.06-2.77).

Table 2 – Demographic data of children who received burns

Accidental Burns			Burns Referred for Child Protection Assessment			P-Value*
Gender			Gender			
	Number	Percentage		Number	Percentage	
Male	469	57.5%	Male	50	54.3%	0.57
Female	345	42.3%	Female	41	44.6%	0.67
Not Indicated	2	0.2%	Not Indicated	1	1.1%	-
Age			Age			
	Number	Percentage		Number	Percentage	
Less than 1	145	17.8%	Less than 1	18	19.6%	0.67
1 to 2 years	259	31.7%	1 to 2 years	33	35.9%	0.42
2 to 3 years	194	23.8%	2 to 3 years	19	20.7%	0.50
3 to 4 years	133	16.3%	3 to 4 years	14	15.2%	0.79
4 to 5 years	85	10.4%	4 to 5 years	8	8.7%	0.61
Ethnicity			Ethnicity			
	Number	Percentage		Number	Percentage	
White - British	513	62.9%	White - British	54	58.7%	0.44
White - Non-British	21	2.6%	White - Non-British	2	2.2%	0.82
Asian	72	8.8%	Asian	8	5.4%	0.97
Afro-Caribbean	23	2.8%	Afro-Caribbean	3	8.7%	0.81
Mixed Race	24	2.9%	Mixed Race	5	3.3%	0.20
Not Indicated	163	20.0%	Not Indicated	20	21.7%	-
Index of Multiple Deprivation			Index of Multiple Deprivation			
	Number	Percentage		Number	Percentage	
1 (Least Deprived)	87	10.7%	1 (Least Deprived)	7	7.6%	0.36
2	80	9.8%	2	6	6.5%	0.29
3	97	11.9%	3	12	13.0%	0.77
4	130	15.9%	4	11	12.0%	0.33
5 (Most Deprived)	243	29.8%	5 (Most Deprived)	38	41.3%	0.02
Not Indicated	179	21.9%	Not Indicated	18	19.6%	-

\*Differences between the proportions for each group as determined by Chi-Squared testing or Fischer's exact test.  $p < 0.05$  is taken as being statistically significant.

### **Accidental Burns**

90.3% (737/816) of burns involved one anatomical site only (Table 3), of which; 84.9% (626/737) affected the hands or arms, 10.9% (81/737) were to the lower limbs. Contact burns involving the head or trunk alone were uncommon, accounting for only 3.7% (30/816) of all cases. 9.7% (79) of children had burns to multiple sites. Amongst the burns that affected multiple sites, the most common patterns seen were burns to both hands (40.5%, 32/79) followed by burns to the hand and adjoining arm (22.8%, 18/79).

Table 3 – Number of cases where burns to an anatomical location were caused by a specific mechanism of interaction with an agent for all accidental burns

Agent	Mechanism of Injury	Location of Body Burned (Number of cases, Percentage of all burns to that location)						TOTAL
		Head and Trunk	Arms	Hands	Legs	Feet	Multiple Sites	
Ovens	Reaching while Stationary	1 (3.3%)	6 (9.8%)	162 (28.7%)			10 (12.7%)	179
	Child on the Move		2 (3.3%)	3 (0.5%)		3 (6.5%)	3 (3.8%)	11
	Pulldown							0
	Independent of the Child							0
	Unwitnessed		1 (1.6%)	9 (1.6%)				10
Hair Straighteners	Reaching while Stationary	2 (6.7%)	2 (3.3%)	74 (13.1%)		1 (2.2%)	5 (6.3%)	84
	Child on the Move	2 (6.7%)	8 (13.1%)	3 (0.5%)	1 (2.9%)	20 (43.4%)	3 (3.8%)	37
	Pulldown			8 (1.4%)	3 (8.6%)		3 (3.8%)	14
	Independent of the Child			1 (0.2%)		2 (4.3%)	1 (1.3%)	4
	Unwitnessed			5 (0.9%)		2 (4.3%)	4 (5.1%)	11
Indoor Heating	Reaching while Stationary		1 (1.6%)	69 (12.2%)			6 (7.6%)	76
	Child on the Move	3 (10.0%)	4 (6.6%)	12 (2.1%)	4 (11.4%)	3 (6.5%)	5 (6.3%)	31
	Pulldown							0
	Independent of the Child							0
	Unwitnessed	1 (3.3%)		8 (1.4%)			4 (5.1%)	13
Irons	Reaching while Stationary		1 (1.6%)	47 (8.3%)		1 (2.2%)		49
	Child on the Move	1 (3.3%)	1 (1.6%)	1 (0.2%)	3 (8.6%)	2 (4.3%)	2 (2.5%)	10
	Pulldown	4 (13.3%)	4 (6.6%)	4 (0.7%)		4 (8.7%)	6 (7.6%)	22
	Independent of the Child	1 (3.3%)		4 (0.7%)	2 (5.7%)	1 (2.2%)	2 (2.5%)	10
	Unwitnessed			16 (2.8%)	4 (11.4%)	2 (4.3%)	3 (3.8%)	25
Kitchen Utensils	Reaching while Stationary	3 (10.0%)	12 (19.7%)	44 (7.8%)			3 (3.8%)	62
	Child on the Move	1 (3.3%)	2 (3.3%)	3 (0.5%)	2 (5.7%)			8
	Pulldown						3 (3.8%)	3
	Independent of the Child	2 (6.7%)	1 (1.6%)	4 (0.7%)	1 (2.9%)	1 (2.2%)		9
	Unwitnessed			2 (0.4%)				2
Outdoor Items	Reaching while Stationary		6 (9.8%)	19 (3.4%)	5 (14.3%)	2 (4.3%)	5 (6.3%)	37
	Child on the Move		6 (9.8%)	2 (0.4%)	4 (11.4%)	2 (4.3%)	3 (3.8%)	17
	Pulldown							0
	Independent of the Child							0
	Unwitnessed		1 (1.6%)		1 (2.9%)			2
Miscellaneous Items	Reaching while Stationary	3 (10.0%)	1 (1.6%)	57 (10.1%)			5 (6.3%)	66
	Child on the Move	1 (3.3%)	1 (1.6%)		3 (8.6%)			5
	Pulldown	2 (6.7%)	1 (1.6%)					3
	Independent of the Child	3 (10.0%)			1 (2.9%)		3 (3.8%)	7
	Unwitnessed			8 (1.4%)	1 (2.9%)			9
TOTAL		30 (100%)	61 (100%)	565 (100%)	35 (100%)	46 (100%)	79 (100%)	816

The most common causative agent for accidental contact burns was the *oven*, in 24.5% (200/816) of the children, 76.0% (152/200) of which were from the oven hob and 23.5% (47/200) from the door of the oven. Radiators were the cause of 58.3% (70/120) of all cases of burns from *indoor heating*. Most agents that caused contact burns were household items, with only 56 incidents reported to be caused by *outdoor items*, primarily barbeques (57.1%, 32/56) and motor vehicle exhausts (30.4%, 17/56). The most common *miscellaneous items* involved in burns included light bulbs and lamps (37.8%, 34/90) and hot food (21.1%, 19/90). The most common mechanism of injury for all agents involved was *reaching while stationary*, which caused burns in 67.8% (553/816) of children.

Table 3 describes the relationships between mechanism, causative agent and the site of the burn and highlights the frequency with which each injury type occurred within this population. The mechanism of injury was more strongly predictive of the site of burn than the agent involved with 83.5% (472/565) of burns to the hands being caused by a *reaching while stationary* mechanism (Table 4). Burns to the hand were by far the most common site affected for reaching injuries irrespective of the agent involved. Multiple burns were most likely to be caused by a *reaching while stationary* mechanism (43.0%, 34/79).

Once movement of a child or of the hot agent was involved, as seen with burns *independent of the child* or in *child on the move* burns, the burns were more widely distributed across anatomical sites. For example, with a *child on the move* the probability of a burn to the feet was 25.2% (30/119), 20.2% (24/119) for the both the hands and arms and 14.3% for the legs (17/119). The most common agents causing burns to the feet were *straighteners* (54.3%, 25/46) and *irons* (21.7%, 10/46).

Whilst burns to the legs were uncommon, most involved the *child on the move* (48.6%, 17/35). *Outdoor items* (28.6%, 10/35) and *irons* (25.7%, 9/35) were the most common causative agents for burns to the legs. There were no burns to the legs caused by *ovens*.

### **Comparison of Accidental Burn Cases to Burns Referred for Child Protection Assessment**

The group of patients who had accidental injuries and those referred for CP assessment were very similar in terms of distribution of age, gender and ethnicity (Table 2). However, it is worth noting that a significantly greater proportion of those referred for CP assessment came from the most deprived background (IMD group 5; 29.8% accidental, 41.3% referred,  $p=0.02$ ). *Reaching while stationary* burns were more likely to be found in children as a result of an accidental injury; 68.7% of accidental burns vs. 35.9% of those referred for CP assessment ( $p<0.001$ ) (Table 4). Burns to the hands were more likely to be accidental; 69.2% accidental vs. 55.4% referred for CP ( $p=0.01$ ). Burns from *irons* (14.2% accidental, 26.1% referred,  $p<0.01$ ), burns *independent of the child* (3.7% accidental, 9.8% referred,  $p=0.01$ ), *unwitnessed* burns (8.8% accidental, 25.0% referred,  $p<0.001$ ) and burns to the head and trunk (3.7% accidental, 15.2% referred,  $p<0.001$ ) were more common amongst the children referred for CP assessment. Some results verged on statistical significance; a *child on the move* tended to be referred slightly more often ( $p=0.07$ ) and burns involving *outdoor items* were slightly less likely to be referred ( $p=0.08$ ).

Table 4 – Table comparing proportions of different agents, mechanisms and locations of burns between accidental injuries and those referred for CP assessment

		Accidental		Referred for Child Protection Assessment		p-value
		Total Number	Percentage	Total Number	Percentage	
Agent	Oven	200	24.5%	16	17.4%	0.13
	Straightener	150	18.4%	15	16.3%	0.62
	Indoor heating	120	14.7%	14	15.2%	0.90
	Iron	116	14.2%	24	26.1%	<0.01
	Kitchen Utensil	84	10.3%	9	9.8%	0.88
	Outdoor item	56	6.9%	2	2.2%	0.08
	Miscellaneous	90	11.0%	12	13.0%	0.56
	Total	816	100%	92	100%	
Mechanism	Reaching while Stationary	553	67.8%	33	35.9%	<0.001
	Child on the Move	119	14.6%	20	21.7%	0.07
	Pulldown	42	5.1%	7	7.6%	0.32
	Independent of Child	30	3.7%	9	9.8%	0.01
	Unwitnessed	72	8.8%	23	25.0%	<0.001
	Total	816	100%	92	100%	
Location	Head and Trunk	30	3.7%	14	15.2%	<0.001
	Arms	61	7.5%	10	10.9%	0.25
	Hands	565	69.2%	51	55.4%	0.01
	Legs	35	4.3%	3	3.3%	0.64
	Feet	46	5.6%	8	8.7%	0.24
	Multiple Sites	79	9.7%	6	6.5%	0.32
	Total	816	100%	92	100%	

## Discussion

This study gives a detailed description as to how the mechanisms and agents involved in a contact burn relate to the anatomical site of a contact burn in children less than five years of age. Overall; the mechanism of injury was found to be more strongly associated with the location of a burn than the causative agent. The agent appears key in determining which mechanisms of interaction are possible or likely; for example, *ovens* and *indoor heating* are fixed objects, and the related mechanisms of injury involved the child touching or running into (moving child) the hazard. *Pulldown* burns largely involved



movable, corded items, the power cord allowing children to reach objects that have been placed above them.

One of the difficulties faced by ED clinicians in assessing burns from a safeguarding perspective is in determining whether the narrative of the story given by a caregiver matches with the burn that is present on the child. Clinicians need to have a clear understanding of the patterns of accidental burn injuries before they can identify unusual or implausible explanations. By analysing three key components of a burn we have been able to pull together common narratives of accidental burns.

Overall, accidental contact burns affected the limbs distally, particularly the upper limbs and largely spared the torso and head. Regardless of which agent caused the burn, the most common mechanism was *reaching while stationary* and the most commonly burned area was the hand. This combination alone accounted for 57.8% (472/816) of all accidental burns analysed. This suggests that most accidental contact burns are due to an infant voluntarily touching a hot object or something near a hot object. It is known that children less than 5 years old lack awareness of the dangers in their environment yet, once they can move, will explore their surroundings and new objects<sup>9</sup>. It is therefore unsurprising to see *reaching* burns to the hands feature so prominently in the data.

A common narrative was that of children moving onto a set of *straighteners*, which led to 43.4% (20/46) of all burns to the feet. *Straighteners* can reach temperatures of over 180°C and take up to 8 minutes to cool<sup>15</sup> and parents are often unaware of the danger that they can pose to infants long after they have been turned off.

Burns that occurred in the kitchen, i.e. those from both *kitchen utensils* and *ovens*, accounted for a high proportion of all accidental cases (34.8%, 284/816). This is possibly explained by younger children needing close supervision, leading to caregivers being more likely to bring them into the kitchen while preparing food, as proposed by Drago<sup>16</sup>.

#### **Comparison to Child Protection Referrals**

There were differences between the agents, mechanism and site of burns in children with accidental injuries and those where a CP referral was made. Whilst a referral for CP assessment is not confirmatory of child abuse, the significant differences in this population illustrate the profile of childhood burns that raised safeguarding concerns of the clinicians involved, and that this profile is different from that of cases that were felt to be accidental. According to RCPCH Child Protection Evidence<sup>17</sup>, there is a relative paucity of information regarding non-scald burns. It is known that contact burns associated with intentional injuries occur on the back, shoulders and buttocks, and that sharply demarcated edges to the burn, which could be matched to the agent, also suggest an intentional injury. Our study has reinforced what is known in terms of location of burns associated with CP concerns. There are a number of other factors that our study has identified as being statistically more or less associated with CP referrals, however, these findings have to be interpreted carefully. Ours is a population study and so results are not applicable to individual cases.

One of the most difficult aspects of safeguarding is the recognition of neglect. There is a spectrum that lies between repeated omission of age appropriate supervision and a transient lapse in supervision<sup>18</sup>. In this study, *unwitnessed* burns affected 8.8% (72/816) of children for whom a child protection referral was not made. Though this may have represented a momentary lapse in judgement, it highlights the need for delivering clear prevention advice to protect the child against future injury.

#### **Strengths and Limitations**

As far as we are aware, this is the first study of its kind to investigate the relationship between the mechanism, agent and burn location in contact burns in young children. The study has a large sample size, has been carried out at multiple centres across the UK and was prospective in nature. There are, however, a number of limitations. Body maps from BaSAT forms were transcribed to a spreadsheet of 57 anatomical locations on the RedCAP database and these were further consolidated into 5 larger anatomical locations. A degree of detail on burn location may have been lost while processing the data.

It is also worth noting that the estimated proportion of cases from recruitment centres was 70-80% and there may have been a pattern amongst these missed cases, or discrepancies amongst the proportion of cases collected at different sites, that may have influenced the results. However, it was felt by the authors of this study that, though coverage was incomplete, 70-80% coverage would be a high enough proportion to be representative of the whole population.

CP issues are inherently difficult to identify and there may be a number of variables that could have impacted on how cases that were referred could have been confounded by other factors we have not assessed. This study does not consider, for example, additional factors which may have led to the CP referral, such as a history of domestic violence in the home or multiple previous ED attendances, as the reason for the CP referral was not documented. Also, given that referral decisions have been made by clinicians, there may be an underlying cognitive bias in what was referred based on their expectations and the differences we are recording may reflect this, rather than objective reasons to have concerns about SP issues. Additionally, there may have been site to site variation as to the thresholds for CP referral.

This study has not looked at final outcomes for the cases that were referred. However, though this is a limitation of the study, it is also worth acknowledging that in the field of CP assessment there is an inherent difficulty in determining with absolute certainty cases of abuse or neglect as there are relatively few absolute markers of confirmation of abuse. As such, amongst the cases referred for CP assessment, will be a number of cases that will remain unproven as abuse or neglect despite those being the underlying cause of this presentation of a burn. Equally, there will be cases we have labelled as accidental, that may have later been found to be due to abuse during a subsequent admission (i.e. false negatives). As the underlying purpose of this study is to find how the mechanism of injury and causative agents influence the location of a burn in accidental cases, with comparisons being made to CP referral cases largely to confirm there is an underlying difference between the two populations, this was not felt to overly influence our primary analysis.

## **Conclusion**

Contact burns are a common presentation to ED for those less than 5 years of age. Regardless of the causative agent, most accidental contact burns were caused by a *reaching while stationary* mechanism and were to the hands. The mechanism of injury had a greater influence over the location of a burn than the causative agent. The table provided will give ED clinicians an objective measure of how these factors lead to specific burn locations.

The findings here may give clinicians in ED a better understanding of the 'Green Flags'<sup>19</sup> for accidental injury and the relationships between agent, mechanism and location of contact burn injuries in young children and alert them to situations that do not conform to these patterns. However, it is worth bearing in mind that even though a burn to the hand or from a reaching while stationary mechanism is statistically significantly less likely to be associated with CP referred cases, they are not unheard of in this group, therefore cannot be entirely dismissed. The information adds further detail to our understanding of the behaviour of young children and may be of use in advising parents on safety in the home such that children are safeguarded from these injuries.

## **Funding**

This study was supported by the *Scar Free Foundation* and *Health and Care Research Wales*.

## **Ethics Approval**

Ethical approval was granted through Cardiff University with waived consent; MREC No. 13/WA/0003, 15/WA/0259 and 15CAG0203.

## **Figures**

Figure 1 Legend – Diagram of exclusion criteria applied to all cases of contact burns in children less than five years of age from BaSAT database

## **Contributorship Statement**

Assim Javaid - Lead author - Writing article and data analysis

C. Verity Bennett - Writing article and data presentation

Linda Hollén - Data analysis and article review

Alison Kemp - Supervision of article and study design

### **What is Already Known on this Topic**

- Contact burns are the most common non-scald burn
- Burns are caused by a complex interplay between the child, environment, causative agent and mechanism of injury
- Intentional contact burns are associated with burns to the back, shoulders and buttocks and with a sharply demarcated, agent-matchable burn edge

### **What this Study Adds**

- The common presentations of accidental contact burns as a relationship between the causative agent, mechanism of injury and anatomical location of a burn
- Burns to the hands or from a *reaching while stationary* mechanism are statistically significantly less likely in cases that result in a child protection referral
- Burns that are *unwitnessed, independent of the child*, from *irons* or to the head or trunk are statistically significantly more likely in cases that result in a child protection referral

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